

Chapter 2.2

ASSESSMENT METHODOLOGY

Conventional Parameter Methodology

State and federal law requires DEQ to produce a biennial report to Virginia's citizens and EPA on the condition of its waters. The waters are evaluated in terms of whether the appropriate designated uses are met: These uses are: 1) wildlife, 2) aquatic life, 3) fish consumption, 4) shellfish harvest, 5) swimming (primary and secondary contact recreation) and 6) drinking water use. DEQ employs the EPA "Percent" Method to assess conventional pollutant impacts in waters for two uses: aquatic life use and swimming use. Additional information regarding water quality assessment guidance and/or methodology can be found on the DEQ website at <http://www.deq.state.va.us/wqa>.

Description of the EPA Fixed Rate (Percent) Method

National guidance issued by EPA recommends that states use an assessment method for the 305(b) report based on assumptions about the kind and frequency of data needed to support such an assessment. The object is to indicate whether waters are fully supporting or impaired for the designated uses and ultimately for the assessment unit (AU). EPA has proposed a 10.5% threshold for determining full support or impaired for conventional pollutants. An exceedence rate that is > 10.5% and has at least 2 exceedences is considered impaired.

In effect, the EPA assessment guidelines imply that an exceedence of a conventional numeric criterion is acceptable in 10.5% of the samples taken. This is due to many variables associated with sampling errors and/or weather factors. The rule of thumb is described in Table 2.2-1

Table 2.2-1 EPA Fixed Rate Assessment Guidelines

Violation Rate (AR) of Total Samples Analyzed	Assessment
$AR \leq 10.5\%$	Meets use (Category 2A or B)
$AR > 10.5\%$	Fails to meet use (impaired) Categories 4A, 5A, 5B, 5C or 5D

In recent years, DEQ has been encouraged to spread its monitoring efforts over more of the State's waters. To achieve this goal with a fixed monitoring budget, the average collection frequency changed from monthly to bimonthly. This new monitoring frequency has been applied to a rotating watershed scheme with 1/3 of the watersheds being monitored within a 2-year cycle. The benefit from this change is that more streams and more stream miles can be assessed. The disadvantage is that the data collected from each station are fewer (12 samples). The data set has become wide geographically but shallow in frequency. This aspect concerns DEQ in that the EPA fixed rate method assumptions are based on a monthly sampling frequency. Further monitoring program review and possible update stems from the need for additional monitoring data for Total Maximum Daily Load (TMDL) development.

EPA ASSESSMENT CATEGORIES and VIRGINIA SUBCATEGORIES

- **FULLY SUPPORTING – Waters are supporting one or more designated uses.**

EPA Category 1: Attaining all associated designated uses and no designated use is threatened.

EPA Category 2: Some of the designated uses are met but there is insufficient data to determine if remaining designated uses are met.

Va. Category 2A - waters are attaining all of the uses for which they are monitored and there is insufficient data to document the attainment of all uses.

Va. Category 2B – waters are of concern to the state but no Water Quality Standard exists for a specific pollutant, or the water exceeds a state screening value.

- **INDETERMINATE – Waters needing additional information.**

EPA Category 3: Insufficient data to determine whether any designated uses are met

Va. Category 3A - no data are available within the data window of the current assessment to determine if any designated use is attained and the water was not previously listed as impaired.

Va. Category 3B - some data exists but is insufficient to determine attainment of designated uses. Such waters will be a prioritized for follow up monitoring.

Va. Category 3C - data collected by a citizen monitoring or other organization indicating water quality problems may exist but the methodology and/or data quality has not been approved for a determination of attainment of designated uses. These waters are considered as having insufficient data with observed effects. Such waters will be a prioritized for follow up monitoring.

Va. Category 3D – data collected by a citizen monitoring or other organization indicate that designated uses are attained however the methodology and/or data quality has not been approved for such a determination.

- **IMPAIRED – Waters are impaired or threatened but a TMDL is not needed.**

EPA Category 4A: impaired or threatened for one or more designated uses but does not require a TMDL because the TMDL for specific pollutant(s) is complete and US EPA approved.

EPA Category 4B: impaired or threatened for one or more designated uses but does not require the development of a TMDL because other pollution control requirements (such as VPDES limits with a compliance schedule) are reasonably expected to result in attainment of the Water Quality Standard by the next reporting period or permit cycle.

EPA Category 4C: impaired or threatened for one or more designated uses but does not require a TMDL because the impairment is not caused by a pollutant and/or is determined to be caused by natural conditions.

- **IMPAIRED – requiring a TMDL**

EPA Category 5: Waters are impaired or threatened and a TMDL is likely needed.

Va. Category 5A - the Water Quality Standard is not attained. The AU is impaired for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).

Va. Category 5B –the Water Quality Standard for shellfish use is not attained. One or more pollutants remain requiring TMDL development.

Va. Category 5C – the Water Quality Standard is not attained due to suspected natural conditions. The AU is impaired for one or more designated uses by a pollutant(s) and may require a TMDL (303d list). WQ Standards for these waters may be re-evaluated due to the effects of natural conditions.

Va. Category 5D - the Water Quality Standard is not attained where TMDLs for a pollutant(s) have been developed but one or more pollutants remain requiring TMDL development.

Va. Category 5E – effluent limited waters are not expected to meet compliance schedules by next permit cycle or reporting period.

CRITERIA TO DETERMINE DEGREE OF USE SUPPORT

Virginia bases its water quality assessment on the ability of the waters to support the associated designated uses. Support is based on the waters meeting the criteria for each use based on the numeric and/or narrative Water Quality Standards. The following is a description of the criteria used to determine the quality of the waters relating to each of the designated uses, and thereby the degree of use support that will be presented in the 305b/303d reports. Waters that do not have water quality data for all designated uses will be designated as insufficient data (Category 3). Additional information related to the degree of use support can be found in the 2004 Assessment Guidance Manual.

1. Not Assessed

Waters with no data for all uses or a single sample (conventional data only) and no exceedence relative to aquatic life and/or swimming use will not be assessed (Category 3A). Waters conventional parameters (DO, pH, temperature, nutrients and bacteria) with a single sample and single exceedence are not assessed (Category 3A).

2. Insufficient Information

Additionally, waters that have a single exceedence in a small dataset (2-9 samples) are considered insufficient data (Category 3B). Additionally, waters that are not QA/QC approved but the assessment results from the data review indicate potential water quality problems are considered insufficient but having observed effects (Category 3C).

3. Insufficient Information with Observed Effects

Waters that are not QA/QC approved but the assessment results from the data review indicate potential water quality problems are considered insufficient but having observed effects (Category 3C).

4. Fully Supporting

The following is a description of the types of data and the acceptable criteria used to assess waters as fully supporting the designated uses. These waters would be placed in the federal Category 2 and Virginia subcategory of 2A unless all designated uses are fully supporting, upon which the water would be placed in Category 1.

Conventional Parameters:

Waters fully supporting the designated uses can have up to 10.5% exceedences of Water Quality Standards for the conventional parameters: fecal coliform and/or E.coli or enterococci bacteria (swimming use), dissolved oxygen, temperature, nutrients and pH (aquatic life use) without negatively affecting the designated uses. Any single exceedence in a small dataset (2-9 samples) will be assessed as insufficient. All data assessed as fully supporting must be QA/QC approved.

The Water Quality Standards (9 VAC 25-260-50) criteria for D.O., pH and Temperature do not apply below (7Q10). 7Q10 is the lowest flow averaged (arithmetic mean) over a period of seven consecutive days that can be statistically expected to occur once every 10 climatic years (a climatic year begins April 1 and ends March 31). Data for these parameters that are from flow conditions below 7Q10 will not be used in the assessment.

Toxic Pollutants:

For toxic pollutant assessment in free-flowing streams, waters where there are one or more samples and no exceedences of a Water Quality Standard aquatic life criteria within a running 3-year period are considered fully supporting for aquatic life and wildlife use. For public water supply and other human health related use (i.e. fish consumption), one or more samples and no exceedences of a Water Quality Standard human health criteria or a fish tissue TV or TSV are considered fully supporting for drinking water and fish consumption uses.

For toxic pollutant assessment in estuarine waters, where there are several types of toxic data available, a weight of evidence approach has been initiated. Additional information on the details of using this approach can be found in Part VI, Section 6.5.3 of the assessment guidance manual.

Fish Tissue/Sediment Contamination

One or more samples and no exceedences of a toxic Water Quality Standard TV or TSV (fish tissue) or sediment (SV) are considered fully supporting.

Biological Evaluation:

For free-flowing stream biological community assessment, data for the overall assessment period is rated as not impaired where no biological assemblage (e.g. macro invertebrates) has been modified beyond the natural range of reference conditions based on EPA Rapid Bioassessment Protocol (RBP) II methodology.

A project to refine the estuarine biological assessment methodology has recently been completed and approved for use by EPA. See Section 6.4.2.2 of the assessment guidance manual for additional information.

Fish Advisories:

Waters where the VDH has not issued any fish advisories or prohibitions.

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Shellfish Advisories:

Those growing areas where no restriction or prohibition (condemnation) on shellfish harvesting is imposed as indicated by the Department of Shellfish Sanitation (DSS) summary dated January, 2003. Additional information on shellfish assessment and consumption use is contained in Part VI, Section 6.4.4 as well as Appendix D of the assessment guidance manual.

Beach Closures:

No VDH beach closures during the assessment period.

Public Water Supply Source Closures:

No VDH public water supply source closures during the assessment period.

5. Fully Supporting with Observed Effects

The following is a description of the types of data and the acceptable criteria used to assess waters as fully supporting but having an observed effect for a designated use(s). It is the intent of the agency to focus additional monitoring resources on the waters that are identified as having an observed effect, based on initial monitoring data analysis. These waters would be placed in the federal Category 2 and the Virginia Subcategory of 2B

Conventional Parameters:

Waters that have > 10.5% and 2 or more SV exceedences for nutrients (Chl a and/or total phosphorus) and sediments are considered fully supporting but having an observed effect for aquatic life use due to the lack of a Water Quality Standard for these parameters (Category 2B).

Toxic Pollutants:

For toxic pollutant assessment in free-flowing streams, a single exceedence from one or more samples of a Water Quality Standard aquatic life criteria within a running 3-year period is considered fully supporting but having an observed effect for aquatic life and wildlife. For public water supply use, a single exceedence of any human health criteria is considered fully supporting but having an observed effect.

For toxic pollutant assessment in estuarine waters, where there are several types of toxic data available, a weight of evidence approach has been initiated. If no additional toxic data is available, the water would be assessed the same as the free-flowing waters. Additional information on the details of using this approach can be found in Part VI, Section 6.5.3 of the assessment guidance manual.

Fish Tissue/Sediment Contamination:

Waters with a single exceedence of a WQS based TV or TSV found in Part VI Section 6.5.3, Tables 6(a) or 6(b) of the assessment guidance manual from one or more samples for fish tissue, or an exceedence of a SV for sediment found in Part VI Tables 7 and 8 of the guidance manual are fully supporting but having an observed effect for fish consumption and aquatic life, respectively.

Biological Evaluation:

For free-flowing waters, biological community data for the assessment period with a single rating of moderately impaired using RBP-II methodology should be considered fully supporting but having an observed effect where professional judgement cannot confirm impairment. If the single moderate impairment was discovered from the last 2 samples, a documented justification for not assessing as impaired is necessary. For waters assessed as fully supporting but having an observed effect for aquatic life use, it is necessary for another biological assessment to be scheduled to make a final aquatic life use determination. Additional information can be found in Part VI Section 6.4.1 of the assessment guidance manual.

A project to refine the estuarine (B-IBI) biological assessment methodology has recently been completed and approved for use by EPA. See Section 6.4.2.2 of the assessment guidance manual for additional information.

Fish Advisories:

VDH fish consumption advisories, where a general advisory has been issued but fish consumption is not limited, are considered fully supporting but having an observed effect.

Shellfish Advisories:

Those growing areas, as indicated by the DSS summary dated January, 2003, that have been classified as conditionally approved (seasonal condemnations) are considered fully supporting but having an observed effect. Additional information on shellfish assessment and consumption use is contained in Part VI, Section 6.4.4 and Appendix D of the assessment guidance manual.

Beach Closure:

One, short term (less than one week in duration) VDH beach closure within the 5 year assessment cycle with a low probability, based on best professional judgement, that the pollution will recur is considered fully supporting but having an observed effect. Best professional judgement decisions could be based on the source of the pollution causing the closure being generally transient and there are no VDH plans to implement pollution reduction measures or other controls.

Public Water Supply Source Closure:

One, short term VDH public water supply source closure during the 5 year assessment cycle with a low probability that the pollution will recur are considered fully supporting but having an observed effect. The source of the pollution is generally transient and there are no VDH plans to implement pollution reduction measures or other controls.

Other Criteria for Waters having Observed Effects:

Waters for which "evaluated" data, trend analysis, or other water quality indicators appear to indicate an apparent effect on designated use(s) or a potential for water quality problems are considered to have "observed effects". Waters can be designated as having observed effects where there is a possible loss of a designated use documented by ancillary data such as fish kills with unknown causes. For monitoring purposes, waters with observed effects should be considered in the next regional monitoring plan for continued monitoring, as resources allow, during the next reporting period.

6. Impaired Waters Not Needing a TMDL

Waters impaired by pollution or natural conditions are impaired but do not need a TMDL. Additionally, those waters that have completed an EPA approved TMDL for specified pollutant or have other pollution control requirements that are expected to result in attainment of the WQ Standards by the next reporting period are considered impaired but not needing a TMDL. These waters are placed in the federal Category 4A, (TMDL complete for a specific pollutant), 4B (control requirements in place) or 4C (pollution and/or natural conditions).

7. Impaired Waters Needing a TMDL

The following is a description of the types of QA/QC approved data and the acceptable criteria used to assess waters as impaired for the designated uses. Those waters impaired by pollutant(s) and needing a TMDL are included in the 303d list. These waters are placed in the federal Category 4A (TMDL complete for a specific pollutant) or 5 (needing a TMDL) and the Virginia subcategories of 5A, 5B, 5D and possibly 5C and 5E.

Conventional Parameters:

Waters with long term or chronic pollutant related problems based on the assessment of monitored data are considered impaired and needing a TMDL. For conventional parameters, at least two exceedences of WQS and exceedences >10.5% range are considered a long term or chronic problem and are considered impaired and needing a TMDL.

Toxic Pollutants:

For toxic pollutant assessment in free-flowing streams, waters where there are 2 or more exceedences of a WQS acute aquatic life toxic criteria in a running 3-year period are considered impaired for aquatic life use and wildlife use. For public water supply use, 2 or more exceedences of the same human health criteria within the reporting period is considered impaired and needing a TMDL.

For toxic pollutant assessment in estuarine waters, where there are several types of toxic data available, a weight of evidence approach has been initiated. Additional information on the details of using this approach can be found in Part VI, Section 6.5.3 of the assessment guidance manual.

Fish Tissue Contamination:

Waters exceeding the same toxic WQS criterion based tissue value (TV) listed in Table 6(a) of the assessment guidance manual, for fish tissue 2 or more times are impaired for fish consumption. For example, both of the following situations would qualify as impaired under these criteria. Two or more fish samples from different species exceeding the same TV

during one sampling event or two or more samples of the same or different species exceeding the same TV from different sampling events within the assessment period.

Biological Data:

For free-flowing waters, the biological community survey data are confirmed to be moderately or severely impaired, are considered impaired and needing a TMDL. Based on professional judgement and/or other supplemental data, a second survey may be required to confirm moderate impairment and/or pollutant related causes. In this case, the initial assessment would be considered fully supporting but having an observed effect and follow-up monitoring scheduled.

A project to refine the estuarine biological assessment methodology has recently been completed and approved for use by EPA. See Section 6.4.2.2 of the assessment guidance manual for additional information.

Fish Advisories:

Virginia Department of Health fish consumption prohibitions and/or advisories where fish consumption is limited are considered non attainment of the designated use WQS and therefore considered impaired and needing a TMDL.

Shellfish Advisories:

Those growing areas, as indicated by the DSS summary dated January, 2003, that have been classified as prohibited and/or restricted (condemnations) based on bacteria data are considered impaired and needing a TMDL. Restricted areas that have been administratively condemned due solely to the presence of a VPDES permitted out-fall or administrative closure where no data is available will not be assessed. Additional information on shellfish assessment and consumption use is contained in Part VI, Section 6.4.4 and Appendix D of the assessment guidance manual.

Beach Closures:

One or more VDH beach closures of one-week or more duration within the assessment cycle with a medium to high probability, based on best professional judgement, the closure will recur. There are VDH plans to implement or have implemented pollution reduction measures or controls.

Public Water Supply Source Closure:

One or more VDH public water supply source closures within the assessment cycle with a medium to high probability that the pollution will recur. There are plans to implement pollution reduction measures or controls.

Table 2.2-2 summarizes the designated use assessment criteria.

Table 2.2-2

Designated Use Assessment Criteria

(Sufficient Data to Assess)

	Fully Supporting Category 2A	Fully Supporting or Insufficient data but Having Observed Effects Category 2B or 3C	Impaired Waters Needing a TMDL Category 5A,5B,5C,or 5D (TMDL Approved = Category 4A)
Conventional Parameters Aquatic Life Use Support (ALUS) and Swimming Use (max temperature will not be assessed in tidal waters)	2 or more samples and AR ≤10.5%	Non QA/QC approved with exceedences > 10.5% (2 or more exceedences in a small dataset (2-9 samples) Nutrient SV exceeded > 10.5% (2 or more exceedences in a small dataset (2-9 samples)	AR > 1 exceedence and > 10.5% (includes small datasets with approved QA/QC)
Toxic Pollutants in Water Column and/or Sediment Aquatic Life Use Support (ALUS) and Wildlife Use	One or more samples and no exceedences	A single exceedence of aquatic life criteria in a 3 year period (ALUS) A single exceedence of a aquatic life criteria in a 3-yr period (Wildlife Use) One or more SV exceed (sediment only) (ALUS)	2 or more exceedences of the same aquatic life criteria in a 3-yr period (water column only) (ALUS) 2 or more exceedences of the same aquatic life criteria in a 3-yr period. (water column only) (Wildlife Use)
Toxic Pollutants related to human health and aquatic life (PWS & Fish Consumption)	One or more samples and no exceedences	A single exceedence of a human health criteria (PWS) A single exceedence of any toxic WQS TV or TSV, listed in Table 6(a) or 6(b) of the assessment guidance manual, for fish tissue	2 or more exceedences of the same human health criteria (PWS) 2 or more exceedences of the same toxic WQS TV, listed in Table 6(a) only of the assessment guidance manual, for fish tissue
Biological Data	Freshwater: Fully Supporting	Freshwater: Slightly Impaired or Unconfirmed, Moderately Impaired, Medium and/or lower quality benthic data show potential WQ problems. Estuarine: See Section 6.4.2.2 of the assessment guidance manual for additional information.	Freshwater: Confirmed or most recent Moderately or Severely Impaired Estuarine: See Section 6.4.2.2 of the assessment guidance manual for additional information.
Fish Consumption Advisories or Restrictions	No restrictions or prohibitions	A VDH advisory which does not limit consumption is in effect	A VDH advisory or restriction limiting or prohibiting consumption is in effect
Shellfish Advisories	No restrictions or prohibitions	Area classified as Conditionally Approved (seasonal condemnations)	Areas classified as Restricted or Prohibited: Excluding VPDES out-falls
Swimming Use (see Conventional Parameter criteria) And Beach Closures	No exceedences	One short term VDH closure with low probability of recurrence (pollution source transient and no VDH plans to implement any control measures)	One or more VDH closure with medium or high probability of recurrence (VDH preparing or implementing controls measures)
Public Water Supply (PWS) Source Closures	No closures	One VDH closure with low probability of recurrence (no VDH plan to implement control measures)	One or more VDH closure with medium or high probability of recurrence (VDH preparing plans to implement or implementing controls measures)

AR = arithmetic exceedence rate

SV = screening value

ALUS = Aquatic Life Use Support

PWS = Public Water Supply